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ABSTRACT

This teachers guide was designed to accompany the educational video entitled "Corn Makes a World of Difference." It highlights the importance of agriculture and its related industries. This guide contains a section on curriculum integration that includes language, math, science, environment, health, geography, and career education. The activities presented contain pre-test and post-test evaluation tools and reproducible student activity sheets. A resource guide for further information is also included. (JRH)

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Corn Makes A World of Difference: Teacher's Guide and Related Activity Program

by
Michael L. Wagner
and
Rob Radway

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MATH - see **page 5** for student activity sheet containing story problems using division, multiplication, and measurement conversion.

Measurement Table:
1 bushel of corn = 56 pounds
1 acre of land = 43,560 square feet
1 gallon = 4 quarts

SCIENCE / ENVIRONMENT / HEALTH - see **page 2** for student activity sheet outlining experiment pertaining to water in seeds and on **page 4** facts concerning two environmentally beneficial corn co-products -- ethanol and biodegradable packaging.

GEOGRAPHY - see **page 4** for a map of Ohio highlighting the sites mentioned in the video. Have students note their location and have them locate similar agricultural sites in your area of the state.

CAREER EDUCATION - The following is a partial list of careers related to agricultural businesses mentioned in *Corn Makes A World Of Difference*: teacher, food service(waitress/ waiter, manager, cook, cashier), farmer, equipment salesman, mechanic, agronomist, county agent, soil and water conservationists, trucker, seed salesman, weigh scales operator. Have students list other related careers.

Outstanding Activities:

Popcorn - measuring the water content of seeds!

Explanation:

All seeds contain a tiny bit of water whose job is to keep cells alive until sprouting. This small amount of moisture makes the popping of popcorn possible. When a kernel of popcorn is heated, the water inside becomes a gas that exerts a strong enough pressure to burst the seed covering. The expansion of the gas allows the soft material from the kernel to puff. This experiment is designed to determine if the amount of water in the kernel affects the popping ability of the seed.

Materials and Equipment:

fresh popping corn	a measuring cup	oven
shallow pan	a six inch ruler	6 tablespoons of corn oil
pot with cover	pencil and paper	

Procedure:

Preheat your oven to 200 degrees F. Count the number of kernels in 1/4 cup of the popcorn. Spread the corn in a single layer in the shallow pan and bake in your preheated oven for approximately 90 minutes. Next count out the same number of kernels. Place 3 tablespoons of corn oil in the pot. Heat the oil until it starts to smoke. Carefully add your second amount of popcorn. Cover and shake over reduced heat until popping stops. Remove the popcorn from the heat. Count the number of unpopped kernels. Measure the longest side of 20 popped kernels with your ruler. Record all your figures and average your findings.

Remove your first batch of popcorn from the oven after 90 minutes (observe if any kernels popped while in the oven). When the kernels have cooled, pop them in the same way as you did your second batch. Again count the number of unpopped kernels and measure 20 of the popped kernels. Record and average your figures.

Compare the figures from the 2 groups!

Observation:

How does the average size of the oven-heated corn compare to the average size of the fresh popcorn? What do you think the heating of the kernels in the oven did to the corn? {The kernels heated in the oven had much of their moisture removed. The findings should reflect the importance of water in seeds!}

Corn Makes A World Of Difference

1992

Teacher's Guide and Related Activity Program

The Ohio Corn Marketing Program is proud to make available to you, the classroom teacher, the educational video entitled *Corn Makes A World Of Difference*. Education and research are two of the primary goals of the Ohio Corn Marketing Program. Stressing the importance of agriculture and its related industries is an important part of the educational program. The Corn Marketing Program in Ohio conducts and sponsors research on new uses for farm products.

Corn is a truly American commodity. One of our country's most valuable renewable resources is corn. It plays an important part in our daily lives:

* FOOD
* FUEL ALCOHOL
* BIODEGRADABLE PRODUCTS
* CHEMICALS

Our teacher's guide is developed with the busy educator in mind. This 9 minute video provides facts and serves as a discussion prompter. The following Teacher's Guide contains:

C urriculum Integration:

language, math, science/environment/health, geography, career education

O utstanding Activities:

pre-test and post-test evaluation tools
reproducible student activity sheets

R esource Guide:

teacher response card
directory for further information

N otable Facts:

discussion prompters
answer key

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Curriculum Integration:

LANGUAGE - see **page 5** for word search activity using related vocabulary.

Glossary terms:

agriculture - the science of cultivating the soil to produce crops or livestock
biodegradable - the ability of a product to decompose by use of microorganisms
bushel - a measurement of grain
combine - a harvesting machine that heads, threshes, and cleans grain while moving over a field
corn meal - ground corn for human consumption
corn oil - the product extracted from the germ of a kernel of corn used in cooking
corn sweetener - a product derived from the starch portion of a kernel of corn
displace - to take the place of
ear - the fruity spike of a cereal grain, such as corn
ethanol - an alcohol produced from the starch of corn
fructose - a type of sugar derived from corn syrup
grain mills - a plant for processing cereal grains into meal or flour
harvest - the act or process of gathering a mature plant
imported - to bring into a country from another country
kernel - a grain or seed of corn
livestock - farm animals raised and used for profit
processing plant - a manufacturing area where raw material is gathered and developed into a usable product
product - an agricultural material made for use
protein - a nitrogen based substance occurring in all living matter and essential to diet
research - a careful study and investigation
silo - a deep or tall bin used to store grain
starch - a white powdery carbohydrate in plants

Pre-test:

1. Wendy's Restaurant uses healthier _____ oil to fry their french fries.

2. Corn is measured in units called _____.

3. _____ from corn is used as a sweetener in pop.

4. To help fight air pollution _____ made from corn can be mixed with gasoline.

5. An American farmer produces enough to feed _____ people.

6. The main ingredient of dog food is _____.

7. Over 22 million Americans work in some phase of _____.

8. Corn is stored in _____.

9. A combine harvests the part of the corn plant known as the _____.

10. Nacho chips are made from _____ _____.

Post-test:

1. The increased use of _____ will help reduce air pollution and our dependency on foreign oil.
   a. ethanol b. corn oil c. gasoline

2. A bushel of shelled corn weighs _____ pounds.
   a. 70 b. 24 c. 56

3. _____ is our nation's largest industry.
   a. Car manufacturing b. Agriculture c. Steel production

4. Wyandot Popcorn produces a variety of products made from _____ _____.
   a. corn meal b. egg whites c. whole milk

5. About _____ million people live on Ohio farms while 22 million are employed in related agribusinesses.
   a. 4 b. 10 c. 2

6. _____ products made from corn are helping solve the problems of our overcrowded landfills.
   a. Steel b. Biodegradable c. Rubber

7. Cargill Milling is in _____ and the Wyandot Popcorn Factory is located in _____, Ohio.
   a. Columbus, Akron b. Toledo, Cincinnati c. Dayton, Marion

8. Corn is milled at Cargill into four main products: _____, _____, _____, _____.
   a. protein, fiber, oil, and starch b. kernels, ears, silk, and husks c. cheese, milk, yogurt, and butter

Follow the Trail of *Corn*

The travels of Amy and Billy took them to several places in Ohio:

Marion- Wyandot Popcorn
&
Ohio Corn Marketing
Reynoldsburg - Wendy's
Dayton - Cargill Milling
Millersport - farm

Can you locate on the map of Ohio where you live? Are there any agricultural related businesses near you?

Corn Co-Products that are Environmentally Sound!

Ethanol

* Ethanol reduces auto emissions helping clean up the air in polluted cities.
* Ethanol's high oxygen content reduces carbon monoxide pollution levels by 25 - 30%.
* Ethanol is made from corn - a renewable American resource - reducing our use of foreign oil.
* United States uses 1 billion gallons of ethanol each year creating jobs.
* Ethanol will not contribute to the "greenhouse effect".
* Much of the food value is removed from the corn before making ethanol so we get both food and fuel.
* One acre of American corn produces 300 gallons of ethanol - enough to drive 4 cars for one year and enough to displace 400 gallons of imported oil.

Biodegradable Packing - (use of corn co-products to speed the decomposition of waste products)

* Biodegradable materials can be made from annually renewable sources such as corn.
* Biodegradable plastics are competitively priced compared to conventional plastics.
* Biodegradable plastics can be composted and used as a carbon rich soil amendment.
* The 95% corn starch "packing peanuts" have captured 10% of the U.S. loose fill market in less than two years.

World of Corn - Vocabulary Word Search Puzzle

Circle the following terms. They may be found written vertically, horizontally, or diagonally

L T B V T P N F N K I B S C H H H D J O
J O U I U Q K C H P R S L O E E S P R X
J O S I N B G C O R N S W E E T E N E R
C K H C H H R B I O D E G R A D A B L E
Q C E U O A G R I C U L T U R E Z E V T
V H L R E R G F G E D B I M P O R T E D
R E O S N V T R J S W I C V W C G X E C
P A E H M E A U A S X F N Z E E Q Y U B
Y R G P R S L C O I G C O E X S Y R W Y
G S O V R T Q T M N N O L U S W T C H Y
B L T D O O I O I G X M G C O R N O I L
N K Y A U A T S J P U B I X I P N R C G
M J W F R C E E P L U I T L F X X N R K
S A T E R C T V I A H N J E L A J M M S
L N A F N T H A R N G E I N H B N E S S
A H R Q C B A A U T O F C B Q E Z A X F
S F L H X J N E E P L O Z S P M S L X X
V X J S I L O Q R N U R B Y Z Y Q C E O
G U L B K H L V T W Z V N H B T H Y T F

agriculture
research
processing plant
cornmeal
harvest
combine
bushel
corn sweetener
livestock
imported
protein
ethanol
starch
silo
biodegradable
grain mill
fructose
product
corn oil
kernel
ear

Math Story Problems

1. If a truck holds 1000 bushels of shelled corn and the mill can unload 300 truckloads per day, how many bushels are dumped (unloaded) per day?

2. A bushel of shelled corn weighs 56 pounds.
   If the mill grinds 55 million bushels of corn every year, how many pounds of corn are produced per year?

3. If Wyandot can pop 2000 pounds of popcorn per hour, how many pounds could they pop in an 8 hour day?

4. One acre of corn can displace 400 gallons of imported oil. How many acres of corn would it take to displace 13,200 gallons of imported oil?

5. If farmer Miller can harvest 5000 bushels of corn per day and his silo hold 30,000 bushels, how many days would it take him to fill his silo with corn?

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Resource Guide:

The Ohio Corn Marketing Program encourages further research of agricultural topics.The following names and addresses are provided if you wish additional information.

Ohio Corn Marketing Program
Michael L. Wagner, Executive Director
1100 East Center Street
Marion, Ohio 43302
614-382-0483

Cargill, Inc.
Richard Thayer
3201 Needmore Road
Box 1400 A
Dayton, Ohio 45413
513-237-1204

Wendy's International, Inc.
Consumer Relations Department
P.O.Box 256
Dublin, Ohio 43017
614-764-6900

Wyandot
Ted Walters
135 Wyandot Avenue
Marion, Ohio 43302
614-383-4031

Ohio Corn Marketing Program
1100 E. Center Street
Marion, Ohio 43302
Phone 614/382-0483

Corn Makes A World Of Difference was produced by the Ohio Corn Marketing Program, Michael L. Wagner, Executive Director. The accompanying Teacher's Guide and Student Activity Sheets were developed and written by Rob Radway of Pine Ridge Media Design.

Teacher response is encouraged. Please use the enclosed response card to share your thoughts as to this educational video, teacher's guide, and activities.

Notable Fact:

* an ear of corn has an average of 800 kernels
* a bushel of corn has approximately 72,800 kernels
* an ear of corn has an average of 16 rows of kernels
* it takes 25 gallons of water to produce an ear of corn
* a bushel of corn fed to livestock produces: 5.6 pounds of beef, 13 pounds of pork, or 19.6 pounds of chicken
* every major non-diet soft drink uses high fructose corn syrup as a sweetener
* one bushel of corn produces enough high fructose corn syrup to sweeten 324 cans of pop
* a bushel of corn when processed produces 2.5 gallons of ethanol
* a bushel of corn produces 1.5 pounds of corn oil
* Ohio uses over 500 million gallons of ethanol-blend fuels per year
* In 1991 there were approximately 35,000 farms in Ohio growing corn
* Ohio produced 326,400,000 bushels of corn in 1991
* In 1991 Ohio harvested over 3,400,000 acres of corn
* 700,000,000 acres of corn are planted in the U.S. (this represents 20% of the world's corn acreage, but 45% of the world's corn crop)

Answer Key:

Pre-test: (1) corn (2) bushels (3) Fructose (4) ethanol (5) 128 (6) corn (7) agriculture (8) silos (9) ear (10) corn meal
Post-test: (1)a (2)c (3)b (4)a (5) c (6)b (7)c (8)a

Vocabulary Word Search:

L T B V T P N F N K I B S C H H H D J O
J O U I U Q K C H P R S L O E E S P R X
J O S I N B G C O R N S W E E T E N E R
C K H C H H R B I O D E G R A D A B L E
Q C E U O A G R I C U L T U R E Z E V T
V H L R E R G F G E D B I M P O R T E D
R E O S N V T R J S W I C V W C G X E C
P A E H M E A U A S X F N Z E E Q Y U B
Y R G P R S L C O I G C O E X S Y R W Y
G S O V R T Q T M N N D L U S W T C H Y
B L T D O O I O I G X M G C O R N O I L
N K Y A U A T S J P U B I X I P N R C G
M J W F R C E E P L U I T L F X X N R K
S A T E R C T V I A H N J E L A J M M S
L N A F N T H A R N G E I N H B N E S S
A H R Q C B A A U T O F C B Q E Z A X F
S F L H X J N E E P L O Z S P M S L X X
V X J S I L O Q R N U R B Y Z Y Q C E O
G U L B K H L V T W Z V N H B T H Y T F

Math Story Problems:

(1) 300,000 bushels (2) 3080 million pounds
(3) 16,000 pounds (4) 33 acres
(5) 6 days

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